



Mitigation of the surficial hydrogeological impact induced by the construction of the Pajares Tunnels (NW Spain).

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Pajares Tunnels are railway tunnels 24.5 km long and 700 m depth drilled in Paleozoic rocks of the Cantabrian Range (NW Spain). The construction of these tunnels is the cause of a very important surficial hydrogeological impact on the Alcedo Valley consisting on: i) the strong alteration of its natural hydrogeological regime; ii) the development of 25 sinkholes from 2007 to 2014 in calcareous rocks covered by alluvial deposits; iii) the transformation of the Alcedo stream into an influent, losing all the surficial water flow by infiltration trough 7 active ponors developed at the stream bed.

The estimated mean water volume infiltration across these sinkholes was around 0.4 Hm³/year (10 l s⁻¹). Previous studies proved the infiltration of this runoff towards the new base level established by the tunnels, which would affect the operation and safety conditions required in a high-speed railway line.

In order to minimize this situation, several geotechnical works have been performed from July 2014 to November 2015. These works consist on: (i) geological research, (ii) borehole drilling, (iii) geophysical prospecting, (iv) sealing of sinkholes and ponors, (v) construction of a concrete channel covered with geotextile and completely buried with original removed alluvial materials, and (vi) environmental restoration. After the completion of these actions, the first observations have allowed to note a total elimination of the infiltration from the Alcedo Valley to the tunnels. This involves an 8% reduction of total drainage in Pajares Tunnels (from average 350 l s⁻¹ to 325 l s⁻¹).